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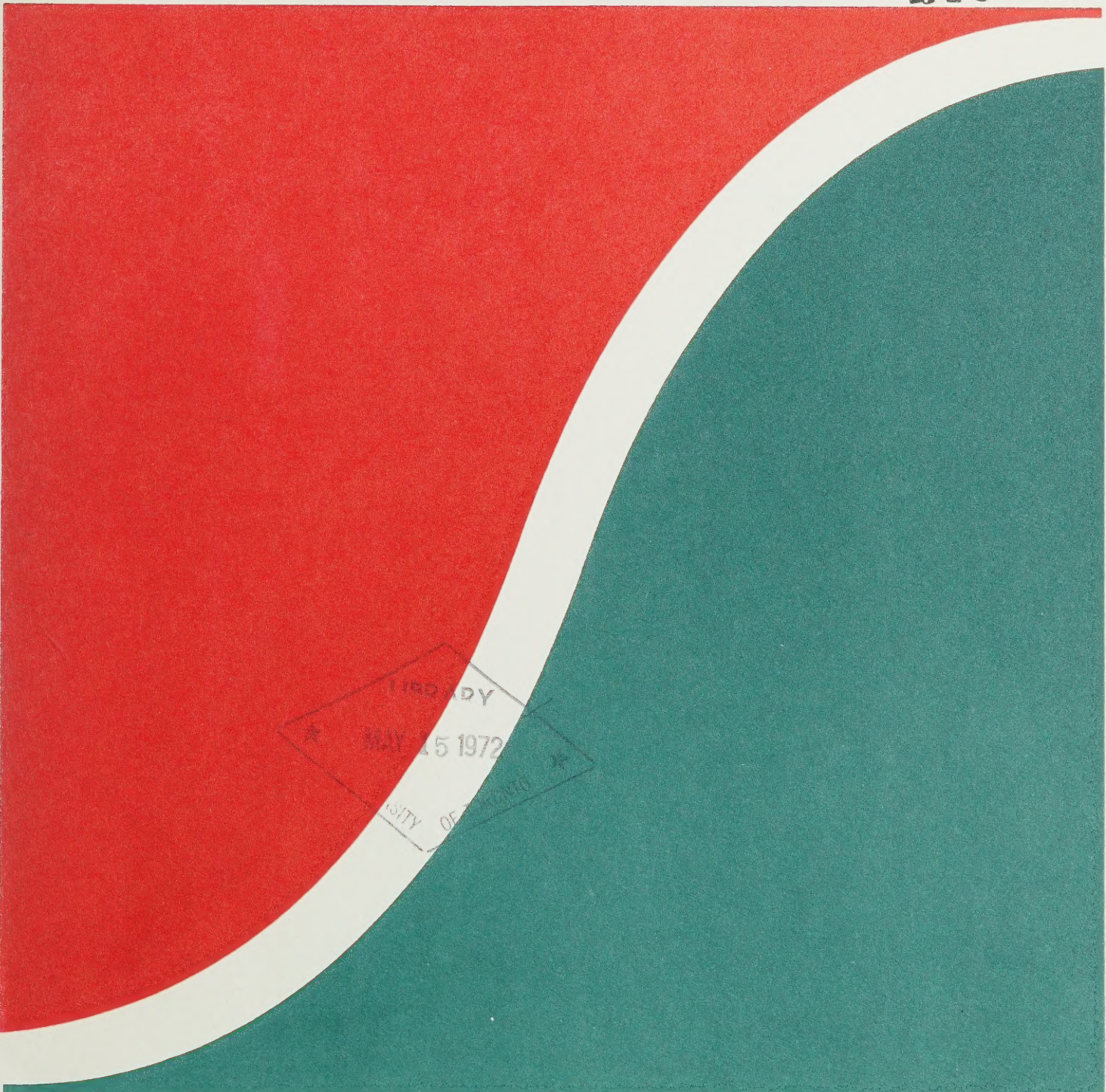
MACHINERY COSTS IN NORTHEASTERN SASKATCHEWAN

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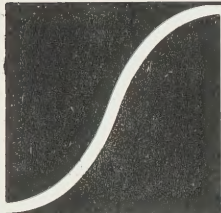
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MACHINERY COSTS ON PARKLAND WHEAT AND GRAIN-CATTLE FARMS IN NORTHEASTERN SASKATCHEWAN

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FOREWORD

The purpose of this report is to provide information for farmers, research and extension workers, agri-business organizations and others involved in the decision-making processes of selecting, using and operating farm machinery in crop production. The basic data on machinery inventories and sequences of operation were obtained from farmers in the Wishart area of Saskatchewan. Information on costs of acquiring farm machinery are based on 1969 prices provided by dealers in farm machinery and supplies. The data on time requirements and costs of machine operation are based for the most part on published and unpublished bulletins and manuscripts from various sources.

The report is the result of joint efforts by staff of the Economics Branch, Canada Department of Agriculture, in the Prairie Regional Office at Regina, Saskatchewan. Special recognition must be given to Mr. Tom Joyce who did much of the work in bringing this material together. Acknowledgement is also given of the contribution and valuable assistance of farmers and farm supply dealers in the area who provided much of the basic information.

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MACHINERY COSTS ON PARKLAND WHEAT AND GRAIN-CATTLE FARMS IN NORTHEASTERN SASKATCHEWAN

L.M. Johnson*

SECTION 1

INTRODUCTION

Machinery costs account for a large part of the expenses in crop production. These costs can vary from farm to farm depending upon such factors as machinery complement, size of farm, tillage practices, and on the efficiency of the farm operator. There is also a wide variation in the numbers, types and sizes of machines on different farms. Larger farms usually have bigger, newer and costlier machines that cover more acres in larger fields in less time. The effective use of machinery is an important part of farm management. On every farm the production costs per acre and per bushel are affected by the degree of efficiency with which the farmer buys and operates his machinery.

OBJECTIVES OF THIS REPORT

The objectives of this report are as follows:

- (1) To present information on the kind, number, size and age of major machines on farms;
- (2) To show the costs of operating the common power, tillage and harvesting machines;
- (3) To indicate the use made of tillage, seeding and harvesting machinery; and
- (4) To present costs of preparing summerfallow and producing grain crops using machines of specified sizes in typical sequences.

SOURCE OF DATA

The data on machinery use, costs and time requirements have been compiled from a research project conducted in 1968 that provided information on income, capital, input requirements and use for wheat and grain-cattle farms in the parkbelt of Saskatchewan (1).

The data were obtained by personal interviews with farm operators, three visits being made to each farm. The study included 76 randomly selected farms from a population of well-established farmers in the study area.

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The operators provided information on farm income and expense including detailed machinery and equipment inventories. Information was also obtained covering field practices, tillage sequences and times over in the various field operations needed to prepare summerfallow and to produce major crops.

Published secondary sources of information were used to describe the study area. Data used to develop machine complements and costs were derived from the primary source material and from prices provided by machine and farm supply dealers in the area.

DESCRIPTION OF THE AREA

The sample farms were in the Rural Municipality of Emerald, No. 277 which is located approximately 95 miles northeast of Regina. Wishart is the principal town servicing the area.

Soils

The farms visited lie within the Black Soil Zone in Saskatchewan. Soils are predominantly loam in texture (2). The Oxbow soil association and its complexes account for 94 percent of the soils in the Rural Municipality of Emerald. Fifty percent of the soils in the municipality fall within Soil Capability Class 2, about 18 percent are Class 1; 5 percent, Classes 3 and 4; and the remainder Classes 5, 6 and 7 (3).

Farm Characteristics

A reconnaissance survey of 352 farm units in the area was conducted in 1967 (4). In this study a farm unit is defined as the land worked by one or more operators with one set of machinery. On the average these farms had 224 acres in wheat, 49 acres in other crops, 10 acres in tame hay and pasture and 148 acres in summerfallow or 431 improved acres per farm. Expressed as a percentage of total improved acres this land use pattern is about the same as that reported by the Census of Agriculture in 1966 (Table 1.1). Almost 70 percent of the farms had cattle and over 50 percent of the farms had hogs. There were 6,851 cattle and 2,302 hogs in the municipality, averaging about 20 cattle and 7 hogs per farm. Thirty-four percent of the farm operators reported some income from off-farm employment. There was more than one operator on 17 percent of the farms but in this analysis only one is classed as the operator for purposes of assigning labor. In 1967, 17 percent of the operators were under 35 years of age; 40 percent were 35-49 years of age; 36 percent were 50-64 years of age; and 7 percent were 65 years of age and over. Seventeen percent of the operators lived in town all year and 4 percent resided in town for part of the year.

Land Use

TABLE 1.1 - LAND USE IN THE RURAL MUNICIPALITY OF EMERALD, NO. 277, 1966

	Total Acres	Percent of Total Improved Acres ^{a/}	Average Acres Per Farm
Total area	199,067	-	474
Total improved	150,925	100.0	359
Under crops	95,021	62.9	226
Fallow	49,909	33.1	118
Pasture	2,827	1.9	7
Other	3,168	2.1	8
Wheat	74,407	49.3	177
Oats	8,744	5.8	21
Barley	5,457	3.6	13
Mixed grains	137	0.1	1
Flaxseed	358	0.2	1
Rapeseed	1,048	0.7	2
Total tame hay ^{b/}	2,525	1.7	6

^{a/} Percentages are not intended to add to 100 as there is a duplication of entries "under crops" and individual crops.

^{b/} Includes 901 acres of oats for fodder.

Source: Census of Canada, Agriculture, 1966.

Farm Size Distribution

TABLE 1.2 - DISTRIBUTION OF FARMS ACCORDING TO TOTAL ACRES IN THE RURAL MUNICIPALITY OF EMERALD, NO. 277, 1966

Farm Size	Number	Percent
Under 240 acres	71	16.9
240 - 399 acres	122	29.0
400 - 559 acres	98	23.3
560 - 759 acres	73	17.4
760 - 1,119 acres	41	9.8
1,120 - 1,599 acres	12	2.9
1,600 and more acres	3	0.7
All farms	420	100.0

Source: Census of Canada, Agriculture, 1966.

Precipitation

Table 1.3 shows the days on which rain was reported and the average precipitation by month during the growing season at the Foam Lake weather station adjacent to the study area. Actual time lost due to weather conditions during tillage, seeding or harvesting operations depends on the amount and intensity of rainfall, on subsequent weather including temperature and wind and on the types of soils. Time lost will vary from one locality to another.

TABLE 1.3 - AVERAGE PRECIPITATION AND NUMBER OF DAYS OF RAIN REPORTED BY MONTH, FOAM LAKE WEATHER STATION, 1957 TO 1969

Month	Average Precipitation	Days on Which Rain Was Reported
	- inches -	- days -
April	.55	5.0
May	1.50	7.9
June	2.06	9.5
July	1.78	9.1
August	1.84	8.6
September	1.55	7.6
October	.88	5.2
Total	10.16	52.9

Source: Monthly Weather Records, Meteorological Branch, Canada
Department of Transport.

Wheat Yields

Average wheat yields per acre in the Rural Municipality of Emerald, No. 277, as compiled by the Economics and Statistics Division, Saskatchewan Department of Agriculture, for three time periods, were: 1950-69, 24.4 bushels; 1960-69, 23.9 bushels; and 1965-69, 25.6 bushels. Ranges in the average annual yields for these three time periods were: 8 to 35 bushels, 8 to 32 bushels and 18 to 32 bushels, respectively.

HOW DATA MAY BE USED

Farm planning and budgeting work should be facilitated by the information on machine costs and time required to prepare summerfallow and to produce crops on grain and grain-cattle farms in the parkland area of Saskatchewan. The data should also assist in selecting machines of appropriate size and in decisions involving timeliness in field operations.

Only the machine costs of crop production are covered in this report. To calculate the total costs for producing crops, it is necessary to add several other items of expense:

- (1) Crop expenses - seed, seed treatment and cleaning, fertilizer, weed spray and crop insurance;
- (2) Real estate - building depreciation and repair, land taxes and insurance;
- (3) Labor - operator's labor and unpaid family labor;
- (4) Interest - building investment and operating capital; and
- (5) Miscellaneous - hydro, telephone, hardware and other tools.

SECTION 2

LAND USE, MACHINERY INVENTORY AND MACHINE COSTS

Section 2 presents information on land use, machinery inventory and operating costs for tractors and combines. Four groups of farms are examined. Groups 1 and 2 are wheat farms and Groups 3 and 4 are grain-cattle farms. Wheat farms are those that have 70 percent or more of the seeded acreage in wheat, less than 5 cows, less than 5 sows and poultry not exceeding 150. Grain-cattle farms could have any combination of grain acreages, but were required to have 8 or more beef cows, less than 5 sows and poultry not exceeding 250.

In Group 1 there are 21 farms with 230 to 410 cropland acres, averaging 310 such acres. Group 2 has 24 farms with 436 to 685 cropland acres, averaging 543 such acres. Group 3 comprises 13 farms having between 258 to 425 cropland acres which average 350 such acres. Group 4 includes 18 farms with 447 to 665 cropland acres which average 558 acres. Groups 1 and 3 are called small farms and groups 2 and 4 are called medium-sized farms.

Table 2.1 shows the organization and use of cropland on the 4 farm groups. On all farms the principal crop is wheat which occupies between 42 percent and 56 percent of the cropland. The percentages of cropland acres in oats and barley are higher on grain-cattle farms than on wheat farms. More grain-cattle farms had more land in forage production than wheat farms. Group averages show that over 90 percent of the wheat crop was planted on summerfallow. Oats and barley were mostly grown on stubble. Summerfallow occupied between 32 to 40 percent of the cultivated acres.

TABLE 2.1 - ORGANIZATION AND UTILIZATION OF CROPLAND ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1968

Item	Unit	Group 1	Group 2	Group 3	Group 4
Total acres per farm		374	659	482	695
Cropland acres per farm		310	543	350	558
<u>Farms growing:</u>					
Wheat on fallow					
(includes durum)	%	100	100	100	100
Wheat on stubble					
(includes durum)	%	67	88	62	94
Oats on fallow	%	-	-	-	17
Oats on stubble	%	29	21	77	78
Barley on fallow	%	5	8	15	-
Barley on stubble	%	29	33	54	67
Seeded forages	%	5	4	62	72
Farms with fallow	%	100	100	100	100
<u>Use of cropland:</u>					
Wheat (includes durum)	%	56.5	54.0	42.0	50.7
Oats	%	2.9	1.8	6.0	4.7
Barley	%	6.5	4.2	8.6	5.0
Mustard	%	-	-	1.7	-
Total grain and mustard	%	65.9	60.0	58.3	60.4
Hay and grain forage	%	0.3	0.2	2.6	4.3
Seeded pasture	%	-	-	2.3	3.2
Total forage	%	0.3	0.2	4.9	7.5
Summerfallow	%	33.8	39.8	36.8	32.1
Total cropland	%	100.0	100.0	100.0	100.0
<u>Use in 1968 of land fallowed in 1967</u>					
Wheat (includes durum)	%	98.5	99.0	90.6	97.5
Oats	%	-	-	-	2.5
Barley	%	1.5	1.0	4.5	-
Other small grains	%	-	-	4.9	-
Total	%	100.0	100.0	100.0	100.0

Machinery Inventory

Information on the number and size distributions of tillage, seeding and harvesting machinery for the four farm groups is set out in Table 2.2. In general the medium-sized farms of both types have larger machinery than the small farms. Not all farms have the machines listed indicating that machines are interchangeable for certain field operations. Some farms do not have a combine, hence this job must be custom hired.

TABLE 2.2 - MAJOR FARM IMPLEMENTS: NUMBER AND SIZES ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1968

Kind of Implement and Size	Unit	Group 1	Group 2	Group 3	Group 4
<u>Cultivators that were</u>					
12 feet and less	%	83	39	77	44
13 - 15 feet	%	13	36	23	56
16 feet and more	%	4	25	-	-
Total	%	100	100	100	100
Cultivators per farm	Number	1.10	1.17	1.00	1.00
<u>Rod Weeders that were</u>					
20 feet or less	%	100	73	100	66
21 - 24 feet	%	-	18	-	17
31 feet and more	%	-	9	-	17
Total	%	100	100	100	100
Rod Weeders per farm	Number	.24	.46	.31	.33
<u>Discers that were</u>					
14 feet or less	%	93	52	83	50
15 - 17 feet	%	7	44	17	50
18 feet and more	%	-	4	-	-
Total	%	100	100	100	100
Discers per farm	Number	.67	.96	.92	.89
<u>Drag Harrows that were</u>					
20 feet or less	%	10	-	38	5
21 - 30 feet	%	70	56	38	60
31 - 40 feet	%	15	36	18	25
41 feet and more	%	5	8	6	10
Total	%	100	100	100	100
Drag Harrows per farm	Number	.95	1.04	1.23	1.11
<u>Packers that were</u>					
15 feet or less	%	100	50	75	75
16 - 20 feet	%	-	50	25	25
Total	%	100	100	100	100
Packers per farm	Number	.14	.17	.31	.22

(continued)

TABLE 2.2 - MAJOR FARM IMPLEMENTS: NUMBER AND SIZES ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1968 - CONCLUDED

Kind of Implement and Size	Unit	Group 1	Group 2	Group 3	Group 4
<u>Drills that were</u>					
12 feet or less	%	60	68	60	79
13 - 14 feet	%	40	20	40	21
15 feet and more	%	-	12	-	-
Total	%	100	100	100	100
Drills per farm	Number	.71	1.04	.77	.78
<u>Sprayers that were</u>					
26 - 35 feet	%	40	67	78	33
36 - 44 feet	%	30	11	-	13
45 feet and more	%	30	22	22	54
Total	%	100	100	100	100
Sprayers per farm	Number	.48	.75	.69	.83
<u>Swathers that were</u>					
P.T.O. - 13 feet or less	%	59	30	50	43
P.T.O. - 14 to 16 feet	%	29	25	40	43
S.P. - 14 feet or less	%	12	25	-	-
S.P. - 15 to 16 feet	%	-	20	10	14
Total	%	100	100	100	100
Swathers per farm	Number	.81	.83	.77	.78
<u>Combines that were</u>					
P.T.O. - Medium	%	6	4	-	5
P.T.O. - Large	%	-	4	-	-
S.P. - Medium	%	77	44	59	53
S.P. - Large	%	17	48	33	42
Total	%	100	100	100	100
Combines per farm	Number	.86	1.04	.92	1.06
<u>Trucks that were</u>					
1/2 - 3/4 ton	%	53	47	44	16
1 - 1 1/2 ton	%	32	17	37	12
2 - 3 ton	%	15	36	19	72
Total	%	100	100	100	100
Trucks per farm	Number	.90	1.50	1.23	1.39

Table 2.3 shows the age distribution of major farm implements, cars and trucks at the time of survey. Usually machines are older on the small farms compared with the medium-sized farms. Much of machinery, however, is aged, 11 years or more on all farms included in the study.

TABLE 2.3 - MAJOR FARM IMPLEMENTS: AGE DISTRIBUTION AT SURVEY TIME ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1968

Kind of Implement and Age	Group 1	Group 2	Group 3	Group 4
	- percent -			
<u>Cultivators that were</u>				
Less than 3 years old	13	25	8	12
3 - 10 years old	65	57	54	44
11 years old or more	22	18	38	44
<u>Rod Weeders that were</u>				
Less than 3 years old	20	18	-	17
3 - 10 years old	60	55	-	83
11 years old or more	20	27	100	-
<u>Discers that were</u>				
Less than 3 years old	14	13	-	19
3 - 10 years old	50	61	33	62
11 years old or more	36	26	67	19
<u>Drills that were</u>				
Less than 3 years old	7	20	-	-
3 - 10 years old	33	28	-	21
11 years old or more	60	52	100	79
<u>Drag Harrows that were</u>				
Less than 3 years old	-	32	12	20
3 - 10 years old	65	36	38	25
11 years old or more	35	32	50	55
<u>Packers that were</u>				
Less than 3 years old	-	-	-	-
3 - 10 years old	-	25	-	-
11 years old or more	100	75	100	100
<u>Sprayers that were</u>				
Less than 3 years old	30	17	12	27
3 - 10 years old	20	44	44	40
11 years old or more	50	39	44	33
<u>Pull-type swathers that were</u>				
Less than 3 years old	-	10	-	8
3 - 10 years old	53	45	22	17
11 years old or more	47	45	78	75

(continued)

TABLE 2.3 - MAJOR FARM IMPLEMENTS: AGE DISTRIBUTION AT SURVEY TIME ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1968 - CONCLUDED

Kind of Implement and Age	Group 1	Group 2	Group 3	Group 4
	- percent -			
<u>Self-propelled swathers that were</u>				
Less than 3 years old	50	33	-	100
3 - 10 years old	50	56	100	-
11 years old or more	-	11	-	-
<u>Trucks that were</u>				
Less than 3 years old	-	20	31	48
3 - 10 years old	21	22	6	40
11 years old or more	79	58	63	12
<u>Cars that were</u>				
Less than 3 years old	14	44	33	13
3 - 10 years old	72	44	56	81
11 years old or more	14	12	11	6

In Table 2.4 additional information is provided about ages of trucks, cars, power-take-off swathers and self-propelled swathers. The percentage of each purchased as new or used is given and indicates that many of these items are purchased second-hand.

TABLE 2.4 - AGE OF TRUCKS, CARS AND SWATHERS ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1968

Item	Unit	Group 1	Group 2	Group 3	Group 4
<u>Trucks purchased</u>					
New	%	26	36	31	32
Used	%	74	64	69	68
Average age of used trucks at time of purchase	years	9.0	9.0	7.5	8.9
Average age of used trucks at time of survey	years	14.0	14.5	12.8	14.6
Average age of all trucks at time of survey	years	13.8	11.4	10.9	12.7
<u>Cars purchased</u>					
New	%	48	75	44	38
Used	%	52	25	56	62

(continued)

TABLE 2.4 - AGE OF TRUCKS, CARS AND SWATHERS ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1968 - CONCLUDED

Item	Unit	Group 1	Group 2	Group 3	Group 4
Average age of used cars at time of purchase	years	5.9	4.5	4.0	4.0
Average age of used cars at time of survey	years	8.1	10.0	7.2	5.7
Average age of all cars at time of survey	years	6.4	4.5	4.9	5.1
<u>P.T.O. swathers purchased as</u>					
New machines	%	33	73	30	50
Used machines	%	67	27	70	50
Average age of used machines at time of purchase	years	9.5	11.0	9.1	10.2
Average age of used machines at time of survey	years	12.6	13.0	14.1	18.5
Average age of all machines at time of survey	years	11.3	10.2	11.8	15.7
<u>S.P. swathers purchased as</u>					
New machines	%	100	67	100	100
Used machines	%	-	33	-	-
Average age of used machines at time of purchase	years	-	6.7	-	-
Average age of used machines at time of survey	years	-	8.7	-	-
Average age of all machines at time of survey	years	2.5	5.0	3.0	2.0

Number, Size, Type and Age of Tractors

Table 2.5 shows the number, age, size and type of tractors on the sample farms. Generally, as farm size increased the number of tractors per farm increased. For all farms the average age of all tractors was 11 years or more. As size of farm increased, the age of tractors decreased. Fifty-seven percent of all tractors in Group 4 were purchased second-hand and this went up to 81 percent for tractors in Group 3.

The average size of all tractors ranged from 33 to 40 horsepower for all farm groups. One could have expected a higher horsepower rating, but the age of tractors in the sample, indicates date of manufacture back in the 1950's when horsepower rating was much lower. Farmers will no doubt purchase more powerful tractors as the older ones are replaced.

TABLE 2.5 - TRACTORS: NUMBER, AGE, SIZE AND KIND ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1968

Item	Unit	Group 1	Group 2	Group 3	Group 4
Total tractors	Number	33	50	26	37
Tractors per farm in sample	Number	1.57	2.08	2.00	2.06
Farms with one tractor	%	48	21	23	17
Farms with two tractors	%	48	54	54	61
Farms with three or more tractors	%	4	25	23	22
Tractors with present age (1968) of:					
Two years or less	%	12	14	-	16
3-10 years	%	12	32	23	16
Eleven or more years	%	76	54	77	68
Average age of all tractors	Years	13.8	11.4	14.3	11.8
Average age of main tractor	Years	12.5	6.3	13.0	8.3
Tractors that when purchased were:					
New	%	30	38	19	43
1-2 years old	%	18	12	12	11
3-10 years old	%	22	28	27	22
11 or more years old	%	30	22	42	24
Average age when purchased	Years	6.1	4.9	7.5	4.8
Size of tractor					
2-3 plow (under 30 h.p.)	%	34	28	38	35
3-4 plow (30-36 h.p.)	%	24	10	27	8
4-5 plow (37-49 h.p.)	%	33	40	35	35
5-6 plow (50-74 h.p.)	%	9	22	-	22
Average size of all tractors	Horsepower	36	40	33	38
Tractors that used:					
Diesel fuel	%	30	58	46	43
Gasoline	%	70	42	54	57

Tractor Costs

Tractor costs represent one of the major items of expense in crop production. These costs include fixed costs, often termed ownership costs, and variable costs. The fixed costs of depreciation and interest on tractor investment remain fairly constant from year to year, being independent of the amount of tractor use. The variable costs of fuel, oil, grease and repairs are, however, directly dependent on the amount of machine use.

Tractor costs are given in Table 2.6. These costs are indicative of 1969 price levels and are subject to the following interpretations:

- (1) Depreciation is calculated on the estimated replacement cost using a straight line method which reduces the value of a machine by an equal amount each year during its useful life.
- (2) Interest is computed at six percent of the estimated present value.
- (3) Fuel, oil and grease costs are based on the quantities reported by farmers in the 1968 survey and on prices prevailing in 1969.
- (4) Repair costs represent actual expenses for parts. The only charge for labor is where it was performed off-farm in a garage or some other type of commercial shop.
- (5) The costs do not include allowances for housing or insurance. Many farmers carry a package insurance policy with blanket provisions for all machinery, equipment and buildings. This creates difficulties in allocating costs to particular items.

For farms of comparable size, tractor value per tractor and per cropland acre are generally higher on wheat farms than on grain-cattle farms. Total tractor costs per farm are, however, somewhat lower on the wheat farms. On a per cropland acre basis costs are rather similar for all sizes and types of farms.

The annual hours of tractor use per farm were estimated by the operators. On the average, tractors were used more on grain-cattle farms than on the wheat farms. The additional hours of tractor use on the grain-cattle farms can be associated with the livestock operations.

All costs of tractor operations in Table 2.6 are group averages and as such cannot be attributed to any particular tractor. Costs for individual tractors are not available. The information, however, does indicate some differences in costs and tractor time on different sizes and types of farms.

TABLE 2.6 - TRACTORS: COST OF OPERATION ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1969

Item	Unit	Group 1	Group 2	Group 3	Group 4
Tractors per farm	Number	1.57	2.08	2.00	2.06
Tractor value per farm	\$	2,106	5,675	2,021	4,371
Value per tractor	\$	1,340	2,724	1,010	2,126
Tractor value per cropland acre	\$	6.80	10.45	5.77	7.84
<u>Tractor costs per farm</u>					
Depreciation	\$	239	608	266	554
Interest (6% present value)	\$	127	341	122	263
Total fixed costs	\$	366	949	388	817
Fuel	\$	231	288	258	356
Lubricant	\$	34	37	34	43
Repairs	\$	188	138	157	285
Total variable costs	\$	453	463	449	684
Fixed and variable costs	\$	819	1,412	837	1,501
<u>Tractor costs per tractor</u>					
Depreciation	\$	152	293	133	269
Interest (6% present value)	\$	80	164	61	128
Total fixed costs	\$	232	457	194	397
Fuel	\$	147	138	129	173
Lubricants	\$	22	18	17	21
Repairs	\$	121	67	78	138
Total variable costs	\$	290	223	224	332
Fixed and variable costs	\$	522	680	418	729
<u>Tractor costs per cropland acre</u>					
Depreciation	\$	.77	1.12	.76	.99
Interest (6% present value)	\$	.41	.63	.35	.47
Total fixed costs	\$	1.18	1.75	1.11	1.46
Fuel	\$	.74	.53	.74	.63
Lubricants	\$	.11	.07	.09	.07
Repairs	\$	.61	.25	.44	.52
Total variable costs	\$	1.46	.85	1.27	1.22
Fixed and variable costs	\$	2.64	2.60	2.38	2.68
Original cost of tractors per farm	\$	3,776	7,125	3,908	6,444
Original cost per tractor	\$	2,403	3,420	1,954	3,135
Annual tractor use per farm	Hours	372	531	513	628
Annual tractor use per tractor	Hours	237	255	256	306

Number, Size, Type and Age of Combines

Table 2.7 presents information on the number, size, type and age of combines in the study area. The medium-sized farms averaged just over one combine per farm whereas the small farm groups have less than one combine per farm. Both groups of grain-cattle farms had older machines than the corresponding groups of wheat farms. The grain-cattle farms also bought more secondhand combines. The larger farms had machines that, when purchased, were newer and larger than those on the smaller farms. There was a high incidence of self-propelled combines (over 92 percent) on all sizes and types of farms. Seeded acres per combine averaged 237, 313, 222 and 318 for farms in Groups 1, 2, 3 and 4 respectively.

TABLE 2.7 - COMBINES: NUMBER, AGE, SIZE AND KIND ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1968

Item	Unit	Group 1	Group 2	Group 3	Group 4
Total combines	Number	18	25	12	19
Combines per farm	Number	.86	1.04	.92	1.06
Combines with present age (1968) of					
Two years or less	%	6	24	8	-
3-10 years	%	28	52	17	47
Eleven or more years	%	66	24	75	53
Average age of all combines	Years	11.3	7.2	12.8	10.5
Combines that when purchased were:					
New	%	44	72	17	31
1-2 years old	%	11	-	-	11
3-10 years old	%	17	16	58	42
11 or more years old	%	28	12	25	16
Average age when purchased	Number	5.1	2.8	7.3	4.6
Size of combine					
Small: 12' and under	%	-	-	8	-
Medium: 13' - 14'	%	83	48	59	58
Large: 15' and over	%	17	52	33	42
Kind of combine					
Self-propelled	%	94	92	100	95
Power-take-off	%	6	8	-	5

Combine Costs

The costs of owning and operating combines in the Wishart area are set out in Table 2.8. Depreciation, interest, fuel, repairs and insurance are subject to the same interpretations that were made for tractor costs in Table 2.6. Combines like tractors are major items of farm equipment that require considerable capital to finance. Actually the combine value on medium-sized grain farms exceeded the tractor value. For the other groups combine values per farm were over 80 percent of tractor values. For both size groups, combine values on grain farms exceeded those on grain-cattle farms.

Depreciation and interest on investment are large items of expense for combine ownership. On a per acre basis these costs represented over 60 percent of the total combine costs for all farm groups in the Wishart area. On farms of comparable size, combine values per farm, per combine and per cropland acre were higher on wheat farms than on the grain-cattle farms. Also, total costs per combined acre were somewhat greater on these wheat farms due to higher depreciation and interest charges on more expensive machines.

TABLE 2.8 - COMBINES: COST OF OPERATION ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1969

Item	Unit	Group 1	Group 2	Group 3	Group 4
Combines per farm	Number	.86	1.04	.92	1.06
Combine value per farm	\$	1,915	6,048	1,628	3,573
Value per combine	\$	2,227	5,815	1,770	3,371
Combine value per cropland acre	\$	6.18	11.13	4.65	6.41
Combined acres per farm	Acres	204	326	204	337
<u>Combine costs per farm</u>					
Depreciation	\$	255	714	300	554
Interest (6% present value)	\$	115	363	98	214
Total fixed costs	\$	370	1,077	398	768
Fuel	\$	45	70	43	70
Lubricants	\$	7	8	9	10
Repairs	\$	128	104	129	130
Total variable costs	\$	180	182	181	210
Fixed and variable costs	\$	550	1,259	579	978
Net of custom combining	\$	52	-5	-23	50
<u>Combine costs per combine</u>					
Depreciation	\$	297	687	326	523
Interest (6% present value)	\$	134	349	107	202
Total fixed costs	\$	431	1,036	433	725
Fuel	\$	52	67	47	66

(continued)

TABLE 2.8 - COMBINES: COST OF OPERATION ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1969 - CONCLUDED

Item	Unit	Group 1	Group 2	Group 3	Group 4
Lubricants	\$	8	8	10	9
Repairs	\$	149	100	140	123
Total variable costs	\$	209	175	197	198
Fixed and variable costs	\$	640	1,211	630	923
<u>Combine costs per combined acre</u>					
Depreciation	\$	1.25	2.19	1.47	1.64
Interest (6% present value)	\$	.56	1.11	.48	.64
Total fixed costs	\$	1.81	3.30	1.95	2.28
Fuel	\$	.22	.21	.21	.21
Lubricants	\$	.03	.02	.04	.03
Repairs	\$	.63	.32	.63	.39
Total variable costs	\$	.88	.55	.88	.63
Fixed and variable costs	\$	2.69	3.85	2.83	2.91
Custom combining costs	\$	.25	-.02	-.11	.15
Total combine costs per cropland acre	\$	2.94	3.83	2.72	3.06
Original cost of combines per farm	\$	3,733	7,022	3,457	5,035
Original cost per combine	\$	4,356	6,741	3,745	4,770
Hours of combine use per farm	Hours	50	84	56	93
Hours of combine use per combine	Hours	58	80	61	88

MACHINE COMPLEMENTS FOR MODEL FARMS

Farm operators and others who are concerned with the development of farm budgets must consider two aspects of machine costs: total annual costs and costs per unit of production. The costs per hour of machinery use are shown for two sizes of model farms in the Wishart area (Tables 2.9 and 2.10).

Depreciation is a cost or a loss in value and service capacity resulting from ordinary wear and tear, accidents and obsolescence. The amount of depreciation must be known to estimate costs, resale value and income tax.

Based on the ownership of a new line of 1969 model equipment, depreciation costs in the tables are calculated as follows:

$$\text{Annual Depreciation} = \frac{\text{Replacement Cost} \times 95\%}{\text{Lifetime Expectancy in Years}}$$

Interest on investment in farm machines is another cost of ownership. For convenience, interest charges are assumed to be the same for each year of lifetime expectancy. The interest charges are computed as follows:

$$\text{Annual Interest} = \frac{\text{Replacement Cost} + \text{Salvage Value} \times .06}{2}$$

The outlay for repairs is also based on replacement costs. Fuel consumption rates are based on Nebraska Tests with modifications for local conditions. All derived costs are at the 1969 price levels that prevailed in the locality.

Two sizes of farms were selected and used to determine machine complements and costs on the model farms. The small farm has 330 cropland acres and the medium-sized farm has 550 cropland acres. The machinery and implements for model farms given in Tables 2.9 and 2.10 represent the typical machinery complements found on the two sizes of farms studied in the Wishart area whether wheat farms or grain-cattle farms.

Based on the above assumptions, the tables summarize the costs of operating selected sizes of machinery for field operations on the model farms. Although these can be used as guides, in the final analysis each farmer must choose a machinery complement to suit his particular situation. The machinery complements shown are not meant to represent the total equipment inventory. Farmers have additional investment in such items as tools, augers, tanks, trailers and trucks.

TABLE 2.9 - MACHINERY COMPLEMENT AND COSTS PER HOUR OF USE, 330 CROPLAND ACRE MODEL FARM, WISHART AREA, SASKATCHEWAN

Machine or Implement	Size	Lifetime Expectancy		Depre- cia- tion	In- terest	Re- pairs	Fuel, Oil, Grease	Total Cost
		Hours	Years					
		- number -			- dollars per hour -			
Tractor (G) ^{1/}	2-3 plow	10,000	15	.40	.20	.25	.66	1.51
Tractor (D) ^{2/}	4-5 plow	10,000	15	.90	.45	.57	.69	2.61
Combine (S.P.) ^{3/}	Medium	1,750	15	5.27	2.27	2.22	.89	10.65
Swather (P.T.O.) ^{4/}	12-foot	2,000	15	.66	.33	.28	.02	1.29
Discer	12-foot	2,000	18	1.11	.67	.32	.02	2.12
Drill	12-foot	1,500	15	1.07	.53	.51	.02	2.13
Drag harrow	24-foot	2,500	20	.11	.08	.02	.01	.22
Cultivator	12-foot	2,000	20	.32	.22	.24	.01	.79
Rodweeder	12-foot	2,000	20	.26	.17	.11	.01	.55
Weed sprayer	32-foot	1,000	20	.31	.20	.32	.01	.84

^{1/} Gasoline tractor

^{2/} Diesel tractor

^{3/} Self-propelled combine

^{4/} Power-take-off swather

TABLE 2.10 - MACHINERY COMPLEMENT AND COSTS PER HOUR OF USE, 550 CROPLAND ACRE MODEL FARM, WISHART AREA, SASKATCHEWAN

Machine or Implement	Size	Lifetime Expectancy		Depre- cia- tion	In- terest	Re- pairs	Fuel, Oil, Grease	Total Cost
		Hours	Years					
		- number -				- dollars per hour -		
Tractor (G) ^{1/}	3-4 plow	10,000	15	.59	.29	.37	.92	2.17
Tractor (D) ^{2/}	4-5 plow	10,000	15	.90	.45	.57	.69	2.61
Combine (S.P.) ^{3/}	Medium	1,750	15	5.27	2.27	2.22	.89	10.65
Swather (P.T.O.) ^{4/}	14-foot	2,000	15	.72	.36	.30	.02	1.40
Discer	15-foot	2,000	18	1.34	.80	.38	.03	2.55
Drill	12-foot	1,500	15	1.07	.53	.51	.02	2.13
Drag harrow	30-foot	2,500	20	.15	.10	.03	.01	.29
Cultivator	14-foot	2,000	20	.39	.26	.28	.01	.94
Rodweeder	15-foot	2,000	20	.29	.19	.12	.01	.61
Weed sprayer	32-foot	1,000	20	.31	.20	.32	.01	.84

- ^{1/} Gasoline tractor
^{2/} Diesel tractor
^{3/} Self-propelled combine
^{4/} Power-take-off swather

SECTION 3

TILLAGE PRACTICES AND MACHINE USE IN CROP PRODUCTION

This section presents information on field sizes and on machines used to prepare summerfallow and to produce and harvest crops in the study area. The data were obtained from farm operators in 1968. It also includes data on machine sizes, farms using and acres worked by each machine as well as times over and acres covered.

Field Sizes

Table 3.1 shows the average field sizes and the ranges in field sizes for grain crops and for summerfallow on the four groups of sample farms. For each crop the horizontal rows of field size percentages should add to 100. In general, the data show that average size of field increased as size of farm increased. There is also a wide range in field size on all groups of farms.

TABLE 3.1 - FIELD SIZES FOR SELECTED CROPS AND SUMMERFALLOW ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1968

Group and Kind of Crop	Field Size				Average Field Size	Range in Field Size	
	50 acres or less	51-100 acres	101-150 acres	151-200 acres		Low	High
- percent of fields in each group -					- acres -		
Group 1							
Summerfallow	40	36	21	3	67	5	155
Wheat: fallow	28	50	14	8	68	4	160
stubble	48	43	-	9	59	10	160
Oats: stubble	83	17	-	-	30	3	70
Barley: stubble	71	29	-	-	52	17	80
Group 2							
Summerfallow	31	35	31	3	80	8	200
Wheat: fallow	48	30	17	5	70	10	160
stubble	47	29	21	3	71	10	188
Oats: stubble	80	20	-	-	47	30	84
Barley: stubble	25	75	-	-	58	15	90
Group 3							
Summerfallow	47	43	10	-	56	10	120
Wheat: fallow	50	50	-	-	52	8	100
stubble	64	27	9	-	60	20	116
Oats: stubble	100	-	-	-	26	15	46
Barley: stubble	57	43	-	-	51	6	105

(continued)

TABLE 3.1 - FIELD SIZES FOR SELECTED CROPS AND SUMMERFALLOW ACCORDING TO SIZE AND TYPE OF FARM, WISHART AREA, SASKATCHEWAN, 1968 - CONCLUDED

Group and Kind of Crop	Field Size				Average Field Size	Range in Field Size	
	50 acres or less	51-100 acres	101-150 acres	151-200 acres		Low	High
- percent of fields in each group -					- acres -		
Group 4							
Summerfallow	27	43	27	3	79	15	190
Wheat: fallow	24	53	18	5	80	7	200
stubble	39	42	19	-	67	16	136
Oats: fallow	100	-	-	-	26	15	37
stubble	87	13	-	-	37	15	73
Barley: stubble	91	9	-	-	45	25	90

Machine Usage to Prepare Summerfallow and to Produce Crops

The information in Tables 3.2 to 3.6 relates to selected fields, not to entire farms. Very small or very large fields were excluded as well as fields where the practices and operations or crops departed from the normal or usual pattern. Tables are shown for summerfallow preparations (Table 3.2) as well as operations for producing the common grain crops on both fallow and stubble (Tables 3.3 and 3.6). Field operations are not shown for crops grown on the sample farms with less than 10 fields. It was decided that fewer than 10 fields would not provide reliable data on the kind and size of machines used to perform the various field operations.

It was impossible to show some infrequent practices for which machine type and size vary widely. For example, a oneway disc might have been a field operation, but one which occurred so rarely that it was incorporated with the discer operation. This is particularly true when new practices or machines are introduced but not adopted by all farmers. All low frequency machine operations have, however, been shown with operations of a similar nature. They are, therefore, included in acreage covered and times over. There are instances where two operations are performed simultaneously, one implement being drawn behind the other. These are shown as one operation for data purposes.

The tables provide information on size of machine, farms using the machine, total acres worked and times over for the different operations used to prepare summerfallow and produce crops. A brief explanation of these tables follows.

The size of machine used is shown according to ranges in feet. There were so many sizes reported that it was meaningless to show each size separately.

Only farms actually using a particular machine are presented. Farms with unused machines are excluded. The column showing farms using this machine should add to 100 percent.

Acres worked is the total number of acres worked by each size-group of machine during the production period. Some farmers may have performed the same operation twice on the selected field; therefore, the acreage worked is doubled. Consequently, the total acreage worked may be equal to, greater or less than the actual acreages in the selected fields.

Times over is always shown as 1.0 or greater than 1.0. For example, in Table 3.2, for discers in the under 15-foot size group, the number of times over is 1.7 for summer operations. Therefore, some farmers went over their fields more than once with this discer. The actual total acreages in the selected fields is 2,900 and the acres worked 1.7 times 2,900 or 4,930 acres.

Acreage covered is expressed in terms of percent. These are the acres worked by each size-range of machine divided by the actual acres in the selected fields. Hence, the percentage of acres covered can be greater than, less than or equal to 100 percent of the acres in the fields used in this study.

Fall cultivation of stubble land to be summerfallowed the succeeding year was practiced on about 70 percent of the acreage. More than one-half the acreages of stubble land seeded to wheat the following year was fall tilled. The most common implements used for fall tillage were the cultivator and discer. These implements together with a rodweeder and harrow were used for seedbed preparation. Both the drill and discer are used for spring seeding operations. Weed spraying is a common practice in this area.

Again it should be noted that the estimates of times over and machines used are observations for a single year. In this analysis, they are assumed to be typical but they can and perhaps do vary from farm to farm and year to year.

Finally, it should be mentioned that the information shown for the selected fields does not represent any particular size of farm. Estimates by size of farm might have been preferred but were too few in number for many crops to make the data meaningful. In any case, the times over or acres covered would not change to any large extent between different sizes of farms. A specific size of machine can be selected to suit a particular farm size. The percentage of acres covered for that operation can be calculated by adding the percentages of acreages covered in the selected fields.

TABLE 3.2 - MACHINES USED AND ACRES WORKED TO PREPARE SUMMERFALLOW, 76
SELECTED FIELDS, WISHART AREA, SASKATCHEWAN, 1968

Operation	Size of Machine	Farms Using this Machine	Acres Worked by Each Machine	Times Over ^{a/}	Acres Covered
	-feet-	-percent-	-acres-	-number-	-percent-
<u>Previous Fall</u>					
Discer	Under 15	38	767	1.0	9.6
	15 - 19	52	1,292	1.0	16.3
	20 - 24	5	102	1.0	1.3
	<u>b/</u>	5	110	1.0	1.4
Cultivator	Under 13	67	1,458	1.0	18.3
	13 - 16	24	475	1.0	6.0
	17 - 22	9	285	1.0	3.6
Cultivator and harrow	<u>c/</u>	100	960	1.0	12.1
Other	<u>c/</u>	100	203	1.0	2.6
<u>Summer</u>					
Discer	Under 15	61	4,930	1.7	62.0
	15 - 19	35	3,799	1.9	47.8
	20 - 24	4	195	1.0	2.5
Discer and harrow	<u>c/</u>	100	260	2.0	3.3
Cultivator	Under 13	63	9,710	2.5	122.2
	13 - 16	29	5,446	2.7	68.5
	17 - 22	6	1,380	2.5	17.4
	Over 22	2	150	1.0	1.9
Tandem disc	14	100	156	2.0	2.0
Cultivator and harrow	<u>c/</u>	100	4,229	1.9	53.2
Cultivator and rodweeder	12	100	380	2.0	4.8
Harrow	Under 35	71	6,965	2.4	87.6
	35 - 44	24	2,348	2.3	29.5
	45 - 54	5	575	2.7	7.2
Rodweeder	Under 20	38	1,600	1.6	20.1
	20 - 22	42	2,079	1.8	26.2
	23 - 24	4	150	1.0	1.9
	Over 24	8	428	1.6	5.4
	<u>b/</u>	8	390	3.2	4.9
Rodweeder and harrow	<u>c/</u>	100	1,114	2.0	14.0
Oneway	8 - 9	100	304	1.5	3.8

^{a/} Times over for farms performing this operation.

^{b/} Size not available.

^{c/} Different sizes.

TABLE 3.3 - MACHINES USED AND ACRES WORKED TO PRODUCE WHEAT ON SUMMERFALLOW, 76 SELECTED FIELDS, WISHART AREA, SASKATCHEWAN, 1968

Operation	Size of Machine	Farms Using this Machine	Acres Worked by Each Machine	Times Over ^{a/}	Acres Covered
	-feet-	-percent-	-acres-	-number-	-percent-
<u>Before Seeding</u>					
Discer	Under 15	80	380	1.0	5.2
	15 - 19	20	75	1.0	1.0
Discer and harrow	c/	100	350	1.0	4.8
Cultivator	Under 13	61	1,580	1.0	21.5
	13 - 16	35	806	1.1	10.9
	17 - 22	4	160	1.0	2.2
Cultivator and rodweeder	12	100	85	1.0	1.2
Cultivator and harrow	Under 13	53	896	1.0	12.2
	13 - 16	27	466	1.0	6.3
	17 - 22	20	319	1.0	4.3
Cultivator, rodweeder and harrow	b/	100	129	1.0	1.8
Harrow	Under 35	65	1,445	1.2	19.6
	35 - 44	30	661	1.2	9.0
	45 - 54	5	120	1.0	1.6
Rodweeder	20 - 22	50	68	1.0	0.9
	b/	50	70	1.0	1.0
<u>Seeding</u>					
Drill	Under 14	34	2,667	1.0	36.2
	14	16	1,128	1.0	15.3
	15 - 18	3	255	1.0	3.5
	Over 18	1	90	1.0	1.2
Discer	Under 15	21	1,441	1.0	19.6
	15 - 19	13	942	1.0	12.8
Other	c/	12	839	1.0	11.4
<u>After Seeding</u>					
Packer	c/	100	620	1.0	8.4
Harrow	Under 35	77	4,849	1.1	65.9
	35 - 44	18	977	1.1	13.3
	45 - 54	5	581	1.7	7.9
Rodweeder	Under 20	50	262	1.0	3.6
	20 - 22	20	145	1.0	2.0
	Over 24	20	323	1.0	4.4
Sprayer	b/	10	55	1.0	0.7
	Under 35	56	3,897	1.0	52.9
	35 - 45	17	1,159	1.0	15.7
	46 - 60	11	881	1.1	12.0
	Over 60	7	361	1.0	4.9
	b/	9	679	1.0	9.2

(continued)

TABLE 3.3 - MACHINES USED AND ACRES WORKED TO PRODUCE WHEAT ON SUMMERFALLOW, 76 SELECTED FIELDS, WISHART AREA, SASKATCHEWAN, 1968 - CONCLUDED

Operation	Size of Machine	Farms Using this Machine	Acres Worked by Each Machine	Times Over ^{a/}	Acres Covered
	-feet-	-percent-	-acres-	-number-	-percent-
Harvest					
Swather	Under 15	52	3,344	1.0	45.4
	15 - 16	42	3,004	1.0	40.8
	b/	6	429	1.0	5.8
Combine	Under 15	51	3,720	1.0	50.5
	15 - 16	42	3,258	1.0	44.3
	b/	7	356	1.0	4.8

^{a/} Times over for farms performing this operation.

^{b/} Size not available.

^{c/} Different sizes.

TABLE 3.4 - MACHINES USED AND ACRES WORKED TO PRODUCE WHEAT ON STUBBLE,
60 SELECTED FIELDS, WISHART AREA, SASKATCHEWAN, 1968

Operation	Size of Machine	Farms Using this Machine	Acres Worked by Each Machine	Times Over ^a / -	Acres Covered
	-feet-	-percent-	-acres-	-number-	-percent-
<u>Previous Fall</u>					
Discer	Under 15	46	335	1.0	7.3
	15 - 19	45	362	1.0	7.8
	b/	9	40	1.0	0.9
Cultivator	Under 13	57	434	1.0	9.4
	13 - 16	36	308	1.0	6.7
	17 - 22	7	120	1.0	2.6
Cultivator and harrow	c/	100	555	1.0	12.0
Other	c/	100	455	1.0	9.8
<u>Before Seeding</u>					
Discer	Under 15	50	315	1.0	6.8
	15 - 19	40	307	1.0	6.6
	20 - 24	10	15	1.0	0.3
Discer and harrow	c/	100	226	1.0	4.9
Oneway	8 - 9	100	66	1.0	1.4
Cultivator	Under 13	59	485	1.2	10.5
	13 - 16	33	210	1.0	4.5
	17 - 22	8	120	1.0	2.6
Cultivator and harrow	Under 13	30	163	1.0	3.5
	13 - 16	50	363	1.0	7.9
	17 - 22	20	260	1.0	5.6
Harrow	Under 35	66	565	1.1	12.2
	35 - 44	27	500	1.3	10.8
	b/	7	15	1.0	0.3
Rodweeder	b/	100	160	1.0	3.5
<u>Seeding</u>					
Drill	Under 14	35	1,461	1.0	31.6
	14	10	407	1.0	8.8
	15 - 18	2	130	1.0	2.8
	Over 18	2	150	1.0	3.2
Discer	Under 15	21	1,066	1.0	23.1
	15 - 19	17	890	1.0	19.3
Other	c/	13	515	1.0	11.1
<u>After Seeding</u>					
Packer	c/	100	340	1.0	7.4
Harrow	Under 35	76	2,887	1.3	62.5
	35 - 44	22	1,159	1.2	25.1
	45 - 54	2	130	2.0	2.8

(continued)

TABLE 3.4 - MACHINES USED AND ACRES WORKED TO PRODUCE WHEAT ON STUBBLE,
60 SELECTED FIELDS, WISHART AREA, SASKATCHEWAN, 1968 - CONCLUDED

Operation	Size of Machine	Farms Using this Machine	Acres Worked by Each Machine	Times Over ^{a/}	Acres Covered
	-feet-	-percent-	-acres-	-number-	-percent-
Rodweeder	Under 20	33	60	1.0	1.3
	20 - 22	67	230	1.0	5.0
Sprayer	Under 35	51	2,199	1.0	47.6
	35 - 45	15	512	1.0	11.1
	46 - 60	16	740	1.0	16.0
	Over 60	9	481	1.0	10.4
	<u>b/</u>	9	347	1.0	7.5
<u>Harvest</u>					
Swather	Under 15	49	1,995	1.0	43.2
	15 - 16	45	1,861	1.0	40.3
	<u>b/</u>	6	147	1.0	3.2
Combine	Under 15	52	2,332	1.0	50.5
	15 - 16	43	2,072	1.0	44.9
	<u>b/</u>	5	180	1.0	3.9

a/ Times over for farms performing this operation.

b/ Size not available.

c/ Different sizes.

TABLE 3.5 - MACHINES USED AND ACRES WORKED TO PRODUCE OATS ON STUBBLE,
34 SELECTED FIELDS, WISHART AREA, SASKATCHEWAN, 1968

Operation	Size of Machine	Farms Using this Machine	Acres Worked by Each Machine	Times Over ^{a/}	Acres Covered
	-feet-	-percent-	-acres-	-number-	-percent-
<u>Previous Fall</u>					
Discer	Under 15	67	179	1.0	15.4
	15 - 19	33	55	1.0	4.7
Cultivator	Under 13	40	68	1.0	5.8
	13 - 16	40	52	1.0	4.5
	17 - 22	20	35	1.0	3.0
Cultivator and harrow	c/	100	181	1.0	15.5
<u>Before Seeding</u>					
Discer	Under 15	60	277	1.4	23.8
	15 - 19	30	75	1.0	6.4
	20 - 24	10	3	1.0	.03
Discer and harrow	Under 15	100	30	1.0	2.6
Cultivator	Under 13	22	80	1.0	6.9
	13 - 16	78	223	1.0	19.1
Cultivator and harrow	c/	100	188	1.0	16.1
Harrow	Under 35	62	198	1.3	17.0
	35 - 44	38	95	1.5	8.1
<u>Seeding</u>					
Drill	Under 14	35	366	1.0	31.4
	14	9	95	1.0	8.1
Drill and packer	Under 14	6	80	1.0	6.9
Discer	Under 15	29	435	1.0	37.3
	15 - 19	18	150	1.0	12.9
Discer and packer	Under 15	3	40	1.0	3.4
<u>After Seeding</u>					
Harrow	Under 35	62	734	1.1	63.0
	35 - 44	38	309	1.0	26.5
Rodweeder	Under 20	50	20	1.0	1.7
	20 - 22	50	35	1.0	3.0
Sprayer	Under 35	45	301	1.0	25.8
	35 - 45	15	130	1.0	11.1
	46 - 60	25	167	1.0	14.3
	Over 60	15	70	1.0	6.0
<u>Harvest^{d/}</u>					
Swather	Under 15	38	427	1.0	36.6
	15 - 16	53	609	1.0	52.2
	b/	3	20	1.0	1.7

(continued)

TABLE 3.5 - MACHINES USED AND ACRES WORKED TO PRODUCE OATS ON STUBBLE,
34 SELECTED FIELDS, WISHART AREA, SASKATCHEWAN, 1968 - CONCLUDED

Operation	Size of Machine	Farms Using this Machine	Acres Worked by Each Machine	Times Over ^{a/}	Acres Covered
	-feet-	-percent-	-acres-	-number-	-percent-
Binder	c/	6	70	1.0	6.0
Combine	Under 15	66	599	1.0	51.4
	15 - 16	34	429	1.0	36.8

a/ Times over for farms performing this operation.

b/ Size not available.

c/ Different sizes.

d/ One farm dried out. The harvested acreage is, therefore, less than the seeded acreage.

TABLE 3.6 - MACHINES USED AND ACRES WORKED TO PRODUCE BARLEY ON STUBBLE,
31 SELECTED FIELDS, WISHART AREA, SASKATCHEWAN, 1968

Operation	Size of Machine	Farms Using this Machine	Acres Worked by Each Machine	Times Over ^a /	Acres Covered
	-feet-	-percent-	-acres-	-number-	-percent-
<u>Previous Fall</u>					
Discer	Under 15	33	35	1.0	2.1
	15 - 19	67	105	1.0	6.4
Cultivator	Under 13	67	364	1.3	22.2
	13 - 16	33	134	1.0	8.2
Oneway	8 - 9	100	75	1.0	4.6
Discer and harrow	Under 15	100	80	1.0	4.9
Cultivator and harrow	c/	100	218	1.0	13.3
<u>Before Seeding</u>					
Discer	Under 15	67	131	1.0	8.0
	15 - 19	33	130	1.0	7.9
Discer and harrow	Under 15	100	55	1.0	3.4
Cultivator	Under 13	71	313	1.1	19.1
	13 - 16	29	108	1.0	6.6
Cultivator and harrow	c/	100	369	1.0	22.5
Harrow	Under 35	67	217	1.0	13.2
	35 - 44	33	135	1.0	8.2
<u>Seeding</u>					
Drill	Under 14	30	393	1.0	24.0
	14	6	99	1.0	6.0
	Over 18	3	90	1.0	5.5
Drill and packer	Under 14	3	75	1.0	4.6
Discer	Under 15	26	384	1.0	23.4
	15 - 19	26	523	1.0	31.9
Discer and packer	c/	6	75	1.0	4.6
<u>After Seeding</u>					
Packer	b/	100	160	1.0	9.8
Harrow	Under 35	68	979	1.3	59.7
	35 - 44	24	380	1.2	23.2
	45 - 54	8	195	2.4	11.9
Rodweeder	Under 20	75	185	1.0	11.3
	20 - 22	25	90	1.0	5.5
Sprayer	Under 35	44	542	1.0	33.1
	35 - 45	24	340	1.0	20.7
	46 - 60	20	281	1.0	17.1
	Over 60	8	130	1.0	7.9
	b/	4	53	1.0	3.2

(continued)

TABLE 3.6 - MACHINES USED AND ACRES WORKED TO PRODUCE BARLEY ON STUBBLE,
31 SELECTED FIELDS, WISHART AREA, SASKATCHEWAN, 1968 - CONCLUDED

Operation	Size of Machine	Farms Using this Machine	Acres Worked by Each Machine	Times Over ^{a/}	Acres Covered
	-feet-	-percent-	-acres-	-number-	-percent-
Harvest					
Swather	12 - 14	45	724	1.0	44.2
	15 - 16	45	777	1.0	47.4
	b/ 8	7	88	1.0	5.4
Binder		3	50	1.0	3.0
Combine	12 - 14	45	629	1.0	38.4
	15 - 16	52	960	1.0	58.6
Thresher	b/	3	50	1.0	3.0

^{a/} Times over for farms performing this operation.

^{b/} Size not available.

^{c/} Different sizes.

SECTION 4

TIME REQUIRED AND MACHINE COSTS FOR TYPICAL SEQUENCES IN CROP PRODUCTION

Information on time required and costs of machine operation is set out in Tables 4.1 to 4.6. All costs relate to 1969 price levels. Table 4.1 presents information on machine sizes, times over, time required and costs per acre for preparing summerfallow. In Tables 4.2 to 4.5, the same information is furnished for producing wheat on summerfallow and wheat, oats and barley on stubble. Time requirements and costs for harvesting operations appear in Table 4.6.

Particular operations for the preparation of summerfallow as well as machine sizes and times over are taken from Table 3.2. For example: the 12-foot cultivator was selected as the specified size of cultivator because 63 percent of the farms in Table 3.2 reported using this particular machine for field operations in the summer of 1968. The "times over" of 2.1 was obtained by adding and rounding the percent of acres covered by all sizes of cultivators in Table 3.2, i.e., 210.0 percent. This indicates that on the average farmers in this area use the cultivator on the summerfallow 2.1 times during the summer.

The total hours for each machine is the actual time taken for the performance of its operation. It does not take into account time lost due to machine breakdowns nor does it include time taken travelling to and from the field. The time is calculated by multiplying the hours per acre by the number of times over.

The costs per acre for the tractor and each machine operation were computed separately then totaled. In each case the total hours of use per acre were multiplied by the per hour costs of operation. The per hour costs of operation included depreciation, interest on investment, repairs, fuel, oil, grease and other lubricants. All the data shown in Tables 4.1 to 4.6 may be interpreted in the same manner.

In this section no estimates are made for some operations that are a part of the crop production process and that cost the farmer time and money. One such operation is the transportation of seed for cleaning to the local elevator or seed cleaning plant. The seed must, subsequently, be taken from the bin to the field. Seed treatment is another common crop service and expense. A further operation for which no costs are estimated is the hauling of harvested grain to granaries or to the elevator.

It is important to the farmer to have the machinery that is most economically-suited to his particular operation in terms both of costs per acre and timeliness of operation. To choose machinery solely on the basis of the least-cost per acre may be a mistake. The lack of timeliness with a particular size of machine can result in decreased returns due to lower yields. Timeliness of operation refers to the completion of a certain operation within an optimum or specified period of time in the production period.

This report does not propose to tell the farm operator which machine or combination of machines to use. Rather, the purpose is to provide data on the costs of operating and the number of acres one can expect to cover with a particular machine. The information represents the typical machine use and cost pattern, but does not take into account external factors such as weather, machine breakdowns or the capability of the operator. The farmer must determine the value he wishes to place on timeliness of operation. In conjunction with this he must choose some combination of machinery to provide the greatest net returns. It may or may not be the least-cost machinery complement.

TABLE 4.1 - TIME REQUIRED AND COSTS OF MACHINERY FOR SUMMERFALLOW OPERATIONS USING TYPICAL SEQUENCES AND SPECIFIED MACHINE SIZES, WISHART AREA, SASKATCHEWAN, 1969

Operation	Machine Size	Times Over	Acres Per Hour	Hours Per Acre	Total Hours	Costs Per Acre		
						Machine	Tractor	Value
	- feet -		- number -			- dollars -		
<u>Previous Fall</u>								
Discer	12	.3	5.7	.17	.05	.11	.14	.25
Cultivator	12	.3	4.8	.21	.06	.05	.17	.22
Cultivator and harrow	12	.1	4.8	.21	.02	.02	.06	.08
<u>Summer</u>								
Discer	12	1.2	5.7	.17	.20	.42	.56	.98
Cultivator	12	2.1	4.8	.21	.44	.35	1.23	1.58
Cultivator and harrow	12	.6	4.8	.21	.13	.12	.36	.48
Harrow	30	1.2	13.9	.07	.08	.02	.22	.24
Rodweeder	24	.6	9.7	.10	.06	.11	.17	.28
Rodweeder and harrow	24	.1	9.7	.10	.01	.02	.03	.05
Total		6.5			1.05	1.22	2.94	4.16

TABLE 4.2 - TIME REQUIRED AND COSTS OF MACHINERY FOR WHEAT ON SUMMERFALLOW USING TYPICAL SEQUENCES AND SPECIFIED MACHINE SIZES, WISHART AREA, SASKATCHEWAN, 1969

Operation	Machine Size	Times Over	Acres Per Hour	Hours Per Acre	Total Hours	Costs Per Acre		
						Machine	Tractor	Total
- feet -		- number -		- dollars -				
<u>Before Seeding</u>								
Discer	12	.1	5.7	.17	.02	.04	.06	.10
Cultivator	12	.3	4.8	.21	.06	.05	.17	.22
Cultivator and harrow	12	.3	4.8	.21	.06	.06	.17	.23
Harrow	30	.3	13.9	.07	.02	.01	.06	.07
<u>Seeding</u>								
Drill	12	1.0	4.2	.24	.24	.51	.67	1.18
<u>After Seeding</u>								
Packer	12	.1	5.7	.17	.02	.01	.06	.07
Harrow	30	.9	13.9	.07	.06	.02	.17	.19
Rodweeder	24	.1	9.7	.10	.01	.02	.03	.05
Sprayer	32	.9	7.3	.14	.13	.11	.36	.47
Total		4.0			.62	.83	1.75	2.58

TABLE 4.3 - TIME REQUIRED AND COSTS OF MACHINERY FOR WHEAT ON STUBBLE
USING TYPICAL SEQUENCES AND SPECIFIED MACHINE SIZES, WISHART AREA,
SASKATCHEWAN, 1969

Operation	Machine Size	Times Over	Acres Per Hour	Hours Per Acre	Total Hours	Cost Per Acre		
						Machine	Tractor	Total
- feet -			- number -			- dollars -		
<u>Previous Fall</u>								
Discer	12	.2	5.7	.17	.03	.06	.08	.14
Cultivator	12	.2	4.8	.21	.04	.03	.11	.14
Cultivator and harrow	12	.2	4.8	.21	.04	.04	.11	.15
<u>Before Seeding</u>								
Discer	12	.2	5.7	.17	.03	.06	.08	.14
Cultivator	12	.2	4.8	.21	.04	.03	.11	.14
Cultivator and harrow	12	.2	4.8	.21	.04	.04	.11	.15
Harrow	30	.2	13.9	.07	.01	.01	.03	.04
<u>Seeding</u>								
Drill	12	1.0	4.2	.24	.24	.51	.67	1.18
<u>After Seeding</u>								
Packer	12	.1	5.7	.17	.02	.01	.06	.07
Harrow	30	.9	13.9	.07	.06	.02	.17	.19
Sprayer	32	.9	7.3	.14	.13	.11	.36	.47
Total		4.3			.68	.92	1.89	2.81

TABLE 4.4 - TIME REQUIRED AND COSTS OF MACHINERY FOR OATS ON STUBBLE USING TYPICAL SEQUENCES AND SPECIFIED MACHINERY SIZES, WISHART AREA, SASKATCHEWAN, 1969

Operation	Machine Size	Times Over	Acres Per Hour	Hours Per Acre	Total Hours	Costs Per Acre		
						Machine	Tractor	Total
			- feet -	- number -		- dollars -		
<u>Previous Fall</u>								
Discer	12	.2	5.7	.17	.03	.06	.08	.14
Cultivator	12	.1	4.8	.21	.02	.02	.06	.08
Cultivator and harrow	12	.2	4.8	.21	.04	.04	.11	.15
<u>Before Seeding</u>								
Discer	12	.3	5.7	.17	.05	.11	.14	.25
Cultivator	12	.3	4.8	.21	.06	.05	.17	.22
Cultivator and harrow	12	.2	4.8	.21	.04	.04	.11	.15
Harrow	30	.3	13.9	.07	.02	.01	.06	.07
<u>Seeding</u>								
Drill	12	1.0	4.2	.24	.24	.51	.67	1.18
<u>After Seeding</u>								
Harrow	30	.9	13.9	.07	.06	.02	.17	.19
Sprayer	32	.6	7.3	.14	.08	.07	.22	.29
Total		4.1			.64	.93	1.79	2.72

TABLE 4.5 - TIME REQUIRED AND COSTS OF MACHINERY FOR BARLEY ON STUBBLE
USING TYPICAL SEQUENCES AND SPECIFIED MACHINERY SIZES, WISHART AREA,
SASKATCHEWAN, 1969

Operation	Machine Size	Times Over	Acres Per Hour	Hours Per Acre	Total Hours	Costs Per Acre		
						Machine	Tractor	Total
- feet -			- number -			- dollars -		
<u>Previous Fall</u>								
Discer	12	.1	5.7	.17	.02	.04	.06	.10
Cultivator	12	.3	4.8	.21	.06	.05	.17	.22
Cultivator and harrow	12	.2	4.8	.21	.04	.04	.11	.15
<u>Before Seeding</u>								
Discer	12	.2	5.7	.17	.03	.06	.08	.14
Cultivator	12	.3	4.8	.21	.06	.05	.17	.22
Cultivator and harrow	12	.3	4.8	.21	.06	.06	.17	.23
Harrow	30	.2	13.9	.07	.01	.01	.03	.04
<u>Seeding</u>								
Discer	12	1.0	4.1	.24	.24	.51	.67	1.18
<u>After Seeding</u>								
Packer	12	.1	5.7	.17	.02	.01	.06	.07
Harrow	30	1.0	13.9	.07	.07	.02	.20	.22
Rodweeder	24	.2	9.7	.10	.02	.04	.06	.10
Sprayer	32	.8	7.3	.14	.11	.09	.31	.40
Total		4.7			.74	.98	2.09	3.07

TABLE 4.6 - TIME REQUIRED AND COSTS OF MACHINERY FOR HARVEST OPERATIONS OF WHEAT, OATS AND BARLEY USING TYPICAL SEQUENCES AND SPECIFIED MACHINE SIZES, WISHART AREA, SASKATCHEWAN, 1969

Operation	Machine Size	Times Over	Acres Per Hour	Hours Per Acre	Total Hours	Costs Per Acre		
						Machine	Tractor	Total
	- feet -			- number -		- dollars -		
<u>Harvest</u>								
Swather (P.T.O.) ^{a/}	12	1.0	3.9	.26	.26	.34	.73	1.07
Combine (S.P.) ^{b/}	Med.	1.0	4.3	.23	.23	2.45	-	2.45
Total		2.0			.49	2.79	.73	3.52

^{a/} Power-take-off swather.

^{b/} Self-propelled combine.

REFERENCES

- (1) Middlemiss, B. and Ragush, M., Costs and Returns, Wheat and Grain-Beef Cattle Farms, Prairie Provinces Parkbelt, 1968, Economics Branch, Canada Department of Agriculture, Regina, Saskatchewan, October, 1969. Publication No. 69/15.
- (2) For a detailed description of soils in the area, see: Ellis, J.G., Acton, D.F. and Clayton, J.S., The Soils of the Regina Map Area. Saskatchewan Institute of Pedology, University of Saskatchewan, Saskatoon, 1965.
- (3) Shields, J.A. and Clayton, J.S., ARDA Soil Capability and Land Inventory, Rural Municipality No. 277. Saskatchewan Institute of Pedology, University of Saskatchewan, Saskatoon, 1967.
- (4) The reconnaissance survey consisted of a visit to all farm operators within the study area. The purpose was to obtain information on type of farm organization, pattern of land use, livestock numbers, extent of off-farm employment, and some general characteristics of the operator and his family. This information was used to stratify all farms according to type and size so that a representative sample could be selected for the more detailed study.



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